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REPORT ON REMEDIAL ACTIONS
LONGVIEW FIBRE COMPANY
SEATTLE, WASHINGTON

For

LONGVIEW FIBRE COMPANY
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Prepared by

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1. INTRODUCTION

In August 1987, three underground tanks used to store liquid hydrocarbons were removed from property owned by the Longview Fibre Corporation. The location of the tanks is shown in Figure 1. Tank 1 was a 12,000-gallon tank used to store Bunker C oil for approximately 2 years before its removal. Prior to that it contained No. 2 diesel. Tank 2 was a 7,500-gallon tank that stored diesel from 1980 until 1987. Prior to 1980, it contained gasoline. Tank 3 was a 1,000-gallon tank used to store fuel oil. It was abandoned in 1980. Details of the tank removal are discussed in "Underground Storage Tank Removals, Longview Fibre Company Seattle Facility" submitted to Longview Fibre on December 8, 1987.

Inspection of the tanks after removal revealed several holes in Tanks 2 and 3 resulting from corrosion. The holes in the tanks and discolored soil observed adjacent to the two perforated tanks indicated that hydrocarbons had leaked into soils surrounding the tanks. Groundwater seeps were observed in the excavations around Tanks 2 and 3, and hydrocarbons were visible in the seeps. Washington Department of Ecology (Ecology) representatives who were present during tank removal requested that groundwater monitoring be performed to investigate the presence of hydrocarbons in the groundwater.

The purpose of this report is twofold: (1) to provide Longview Fibre Company with available information with respect to the subsurface hydrocarbons from the preliminary hydrogeologic investigation, and (2) to provide planning level costs associated with additional professional services and possible remedial actions. Before further action is initiated at the site, Longview Fibre should approach Ecology to negotiate the scope of remedial actions and cleanup standards that might be required by the agency. These negotiations will better establish the need for and magnitude of future investigative and remedial activities.

This report discusses investigations and possible remedial actions regarding possible hydrocarbon releases to the subsurface at the facility. Activities to date have consisted of installing and sampling three monitoring wells. The results of this limited hydrogeologic investigation are presented in Section 2 of this report. Section 3 describes subsurface hydrocarbons and planning level costs that might be associated with each possible action. The actions described in Section 3 are based upon the limited data available from the preliminary hydrogeologic investigation that

has been performed at the site. The technologies presented are consistent with current engineering practices. Final selection of remedial actions and further investigations should be based upon negotiations with Ecology. Section 4 summarizes report findings and conclusions.

2. HYDROGEOLOGIC CONDITIONS

In response to the observation of discolored soils and hydrocarbons in groundwater seeps at Tanks 2 and 3 when they were removed, Longview Fibre proceeded with a preliminary hydrogeologic investigation to begin characterizing the extent of subsurface hydrocarbons at the facility. This section of the report documents the installation of monitoring wells, monitoring of water levels, and analytical results of groundwater sampling at the Seattle Longview Fibre facility.

Local water table depths are known to be shallow, making it possible for hydrocarbons leaked from the tanks to mix with shallow groundwater. Three shallow monitoring wells were installed in the vicinity of the buried tank locations, as shown in Figure 1. The purpose of installing these wells was to help characterize shallow site stratigraphy, to provide data needed to make an initial evaluation of groundwater flow beneath the site, and to determine whether the groundwater contained detectable quantities of floating and/or dissolved hydrocarbons.

MONITORING WELL INSTALLATION

All three monitoring wells were drilled and installed by Pacific Testing Laboratories using a mobile B-75 hollow-stem auger rig. Each well was installed using the 4-inch inside diameter (ID) auger as temporary casing to ensure the proper placement of the screen assembly, sand pack, and upper seal. All drilling and well installation were supervised by a CH2M HILL hydrogeologist. Well completion details and lithologic logs are presented in Figures 2 through 4.

CH2M HILL surveyed all three monitoring wells after installation was completed. The top of casing and adjacent ground surface elevations were tied into the National Geodetic Vertical Datum (NGVD). These elevations are reported in Figures 2 through 4.

SITE STRATIGRAPHY

The Longview Fibre plant is located in the Duwamish Valley adjacent to and very near the mouth of the Duwamish River. The area was originally a tidal flat; surface sediments of tidal flats are characterized as fine to very fine grained and containing an abundance of organic and plant material. The lithologic logs in Figures 1 through 3 show that these naturally deposited sediments are buried under 7 to 15 feet of fill material. This fill is predominantly fine sand and silt with sporadic rounded pebbles, and was dredged from the waterway and spread over the original tidal flat surface when the area was being developed.

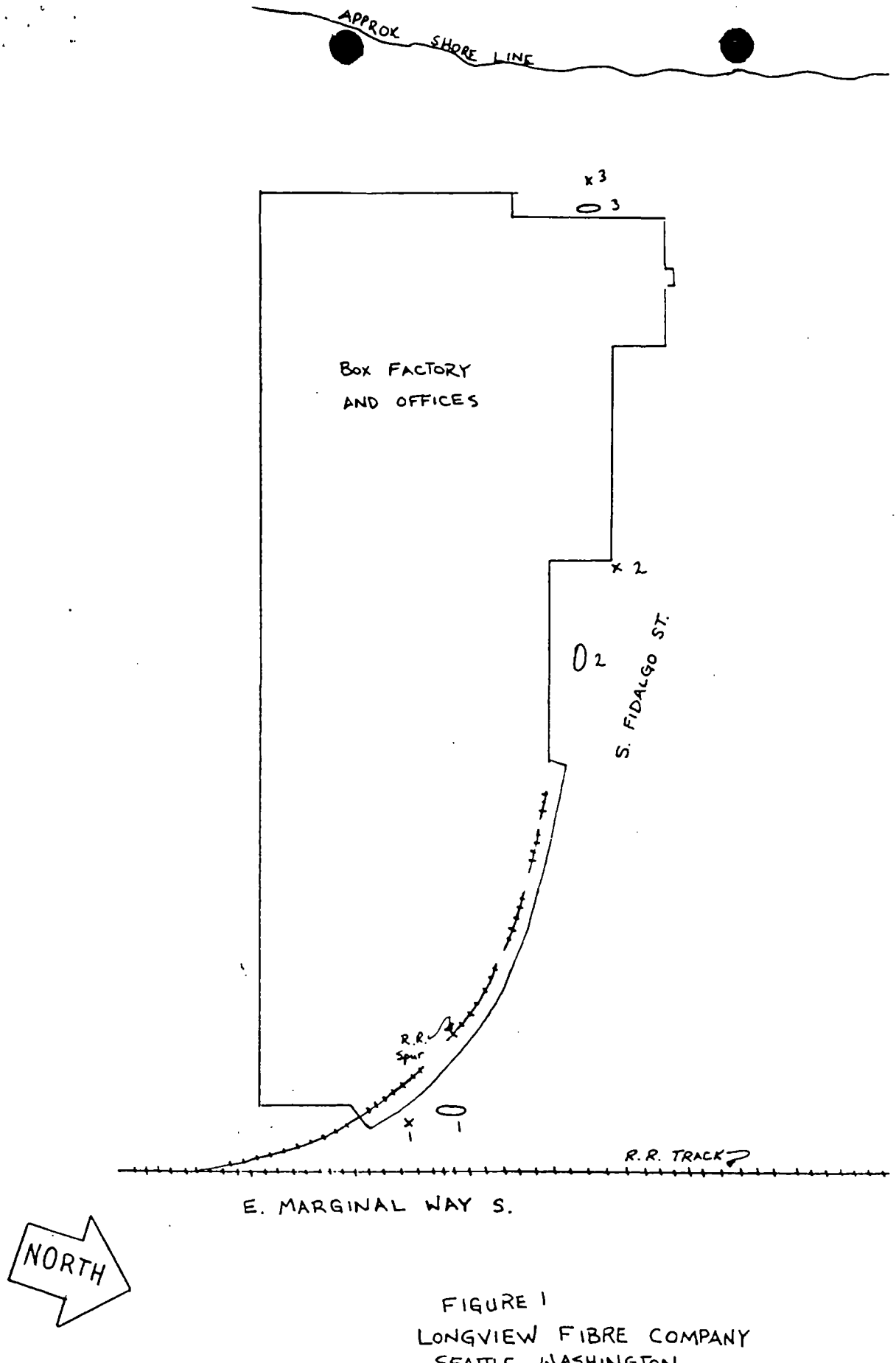

FIGURE 1
LONGVIEW FIBRE COMPANY
SEATTLE, WASHINGTON
SITE PLAN WITH APPROXIMATE TANK AND WELL LOCATIONS

KEY:
O FORMER TANK LOCATION
X WELL LOCATION

Figure 2

MONITORING WELL GEOLOGIC & CONSTRUCTION LOG

PROJECT NUMBER	WELL NUMBER	SHEET
S24054.A0	MW-1	1 OF 1

PROJECT Longview Fiber LOCATION Adj. to RR tracks in front of Bldg

ELEVATION, NGVD (Top of Well Casing) 9.54 SURFACE ELEVATION, NGVD 9.82

WATER LEVEL ELEVATION, NGVD START DATE 10/27/87

DRILLING CONTRACTOR Pacific Testing Labs FINISH DATE 10/28/87

DRILLING METHOD Mobile B-75 Hollow Stem Auger

DEPTH (Ft)	CONTACT DEPTH (Ft)	GEOLOGIC LOG & USCS DESIGNATION	HYDROLOGIC UNIT	WELL CONSTRUCTION
0	1	Brown silty-sandy topsoil.		Steel Monument 6-inch locking steel casing Type I Portland Cement 1/2" Bentonite Pellets hydrated 2-inch Sch 40 PVC Blank Pipe, Flush Thread
5		Gray to grayish brown sand. fg-mg, well sorted, 5-10% gravel in upper 6 feet, 10% silt in lower 5 feet. Large obstruction at 8 feet (approximately 1 foot thick) located 3 feet east of well.		2-inch Sch 40 PVC Machine Slot Screen. 0.010-inch slot width, flush thread
10	12	Hit water at 12 feet. Heaving sand below water table.		CSSI 8-12 sandpack 8-inch borehole
15	14.6	Total Depth		2-inch PVC bottom sump, flush thread
20				
25				

Gradational Contact - - -

Visible Contact ———

Figure 3

MONITORING WELL GEOLOGIC & CONSTRUCTION LOG

PROJECT NUMBER	WELL NUMBER	SHEET
S24054.A0	MW-2	1 OF 1

PROJECT Longview Fiber LOCATION Adj. to truck bay, middle of bldg.

ELEVATION, NGVD (Top of Well Casing) 9.61 SURFACE ELEVATION, NGVD 9.88

WATER LEVEL ELEVATION, NGVD START DATE 10/28/87

DRILLING CONTRACTOR Pacific Testing Labs FINISH DATE 10/28/87

DRILLING METHOD Mobile B-75 Hollow Stem Auger

DEPTH (Ft)	CONTACT DEPTH (Ft)	GEOLOGIC LOG & USCS DESIGNATION	HYDROLOGIC UNIT	WELL CONSTRUCTION
0				Steel Monument
	1	Brown sandy topsoil		6-inch locking steel casing
		Gray sand, fg-mg, well sorted, trace of silt, 5-10% well rounded gravel up to 3" in diameter. (SP)		Type I Portland Cement
				1/2" Bentonite Pellets hydrated
5	5.5			2-inch Sch 40 PVC Blank Pipe, Flush Thread
		Black sand, fg-mg, well sorted, trace of silt, no gravel. (SP)		
		Hit water at 7.5 feet below ground level.		2-inch Sch 40 PVC Machine Slot Screen, 0.010-inch slot width, flush thread
10				CSSI 8-12 sandpack
	11.5	Gray sand, fg-mg, well sorted, trace of silt. (SP)		8-inch borehole
	13	Silt, light brown, fiberous organic matter prevalent (woody).		
15	15.2	Total Depth		2-inch PVC bottom sump, flush thread
		Gradational Contact - - -		
		Visible Contact ———		
20				
25				

Figure 4

MONITORING WELL GEOLOGIC & CONSTRUCTION LOG

PROJECT NUMBER	WELL NUMBER	SHEET
S24054.A0	MW-3	1 OF 1

PROJECT Longview Fiber LOCATION Back of bldg near loading dock

ELEVATION, NGVD (Top of Well Casing) 11.76 SURFACE ELEVATION, NGVD 12.08

WATER LEVEL ELEVATION, NGVD ____ START DATE 10/26/87

DRILLING CONTRACTOR Pacific Testing Labs FINISH DATE 10/26/87

DRILLING METHOD Mobile B-75 Hollow Stem Auger

DEPTH (Ft)	CONTACT DEPTH (Ft)	GEOLOGIC LOG & USCS DESIGNATION	HYDROLOGIC UNIT
0	1	Brown silty loam topsoil	
	3	Brown-gray silt and fine sand.	
5		Gray sand, fg-mg, well sorted, trace silt (SP)	
	7.5	Plant fragments.	
	9	Brown silt, wet, oily sheen visible and strong odor of diesel fuel.	
10		water level	
15	15.7	Total Depth	
		Gradational Contact ----	
		Visible Contact ———	
20			
25			

WELL CONSTRUCTION

- Steel Monument
- 6-inch locking steel casing
- Type I Portland Cement
- 1/2" Bentonite Pellets hydrated
- 2-inch Sch 40 PVC Blank Pipe, Flush Thread
- 2-inch Sch 40 PVC Machine Slot Screen. 0.010-inch slot width, flush thread
- CSSI 10-20 sandpack
- 8-inch borehole
- 2-inch PVC bottom sump, flush thread

NOTE: Depth to water not measured due to presence of product.

MVLF, 1-87

GROUNDWATER CONDITIONS

Shallow groundwater flow in the vicinity of the Longview Fibre site probably is influenced by tidal action because of the proximity to the Duwamish Waterway. Depth to groundwater varies but is generally less than 15 feet below the surface. Table 1 presents water table elevation data collected over a period of 2 days. High and low tide elevations and their respective times have been included for purposes of comparison.

Table 1
GROUNDWATER AND TIDE ELEVATIONS

Date	Tide	Well	Tide Time	Groundwater Measuring Time	Depth to Water (feet)	Water Table Elevation (NGVD)	Approximate Tide Elevation (NGVD)
11/18/87	High		0315				3.3
	Low		0824				-0.6
	High		1403				5.0
		MW-1		1435	7.78	3.98	
		MW-2		1430	4.59	5.02	
		MW-3		1423	8.99	0.55	
	Low		2105				5.8
11/19/87	High		0403				4.2
		MW-1		0635	9.07	2.69	
		MW-2		0637	4.59	5.02	
		MW-3		0645	11.25	-1.71	
	Low		0906				0.1
	High		1428				4.9
		MW-1		1431	8.94	2.82	
		MW-2		1427	4.44	5.17	
		MW-3		1420	7.80	1.74	
		MW-1		1915	8.99	2.77	
		MW-2		1918	4.61	5.00	
		MW-3		1922	12.27	-2.73	
	Low		2139				-7.0

The data in Table 1 show that water levels in MW-1 and MW-3 varied over a range of 1.29 feet and 4.47 feet, respectively for the period of measurements. MW-2, located between MW-1 and MW-3, displayed very little water level change. Not enough water level data exist to verify the reason for the observed variation in water levels, but it is likely that they are caused by tidal fluctuations. It is not known why MW-2 responds differently from MW-1 and MW-3.

OCCURRENCE OF SUBSURFACE HYDROCARBONS

Evidence of hydrocarbons was visually observed during drilling of MW-3. A strong diesel fuel odor was noted in soils encountered between 10 and 15 feet in this well. During collection of water level data in the three monitoring wells, a diesel fuel odor was noted in MW-2, and floating hydrocarbons were present in Well MW-3. Water level data were obtained after well installation. The presence of floating hydrocarbons in MW-3 interferred with the instument used to measure water levels; as a result, water level at time of well installation is not available for MW-3. These observations correlate with the discolored soils and hydrocarbons observed in seeping groundwater during removal of Tanks 2 and 3.

ANALYTICAL RESULTS

Groundwater samples were collected from the three wells on December 7, 1987. Although floating hydrocarbons were present in water initially purged from Well MW-3, a water sample was obtainable following purging of this well. The groundwater samples were analyzed for total fuel hydrocarbons (diesel), and for benzene, toluene, and xylene, major gasoline components. A blank sample of distilled water was also submitted for analysis. Results of the analyses are shown in Table 2. Laboratory report sheets are included as Attachment 1. Groundwater sample collection, handling, and transportation were performed in accordance with standard practices outlined in EPA Guidance Manual SW-846.

The only gasoline component detected in the three monitoring wells was xylene, which was present at 12 parts per billion (ppb) in MW-3. The higher detection limits for these compounds in MW-3 was attributed to matrix interference, likely due to the presence of emulsified oil in this sample. Total fuel hydrocarbons were highest in concentration in MW-3 at 170 parts per million (ppm) and were present at 0.39 ppm in MW-2. Total fuel hydrocarbons were present at the detection limit of 0.05 ppm in the presumed upgradient well, MW-1. The blank sample (labeled as MW-4) yielded reults below detection limits for all constituents except xylene, which was 0.1 ppb above the detection limit of 0.5 ppb.

The analytical data correlate with field observations of subsurface hydrocarbon occurrence and reported underground fuel storage at the site. The low or nondetected levels of gasoline components (benzene, toluene, and xylene) in groundwater samples indicate subsurface leakage of gasoline is likely not a problem at the site, and correlate with the reported limited onsite storage of gasoline. Total fuel hydrocarbons detected are indicative of higher molecular weight hydrocarbons found in heavier fuels, such as diesel fuel.

Table 2
GROUNDWATER SAMPLING RESULTS
DECEMBER 7, 1987, SAMPLING

Sample Number	Benzene (ppb)	Toluene (ppb)	Xylene (ppb)	Total Fuel Hydrocarbons (ppm)
MW-1	<0.5	<0.5	<0.5	0.05
MW-2	<0.5	<0.5	<0.5	0.39
MW-3	<5.0	<5.0	12	170
MW-4 (blank)	<0.5	0.6	<0.5	<0.05
Detection Limit[a]	<0.5	<0.5	<0.5	<0.05

[a]Detection limits shown for benzene, toluene, and xylene apply to MW-1, MW-2, and MW-4 only. Matrix interference in the MW-3 sample resulted in a higher detection limit of 5.0 ppb benzene, toluene, and xylene for that sample. EPA Method 602-8020 was performed to test for benzene, chlorinated benzene compounds, and ethyl benzene, but all were below detection limits.

The relatively low total fuel hydrocarbon level in Well MW-2 indicates that subsurface hydrocarbons likely do not extend as far east as the MW-2 location. The higher concentration of total fuel hydrocarbons in the MW-3 water sample correlates with observations of free floating hydrocarbons in this well.

The three initial monitoring wells confirmed the presence of hydrocarbons at these locations. Evaluation of subsurface hydrocarbon extent in the vicinity of these wells will require additional data collection activities, as described in Section 2 of this report.

4. CONCLUSIONS

Preliminary data from sampling at the Longview Fibre Seattle, Washington facility indicate the presence of fuel hydrocarbons in the shallow aquifer beneath the site. The shallow aquifer appears to be tidally influenced. Constituent concentrations (xylene and total petroleum hydrocarbons) were highest near the former location of Tank 3 at the west end of the Longview Fibre property. Fuel hydrocarbons were also found at concentrations above background in a sample collected near the previous location of Tank 2.

A number of alternatives were considered for the next action at the site. These included french drain systems, pumping wells, automated skimmers, bioremediation, environmental assessment, soil excavation and pumping wells, and a no-action alternative. Based upon technical feasibility, anticipated effectiveness of each alternative in removing subsurface hydrocarbons, cost, and the perceived likelihood of Ecology concurrence, it was determined that additional environmental assessment, product recovery from pumping wells, an automated skimming system, and possible water treatment were the actions best suited for consideration at this time. Environmental assessment would include test borings, monitoring wells, and groundwater sampling to determine the extent of the subsurface hydrocarbons. Product recovery using pumping wells equipped with skimmers could follow an environmental assessment and, if needed, depending upon the effectiveness of skimming and required cleanup levels, could be coupled with activated carbon treatment of groundwater. Another product recovery system that might be effective and that could be put into service prior to initiating an environmental assessment consists of an automated skimming system that could be installed in existing MW-3. This could be followed by an assessment of the extent of the plume and could be combined with a similar groundwater treatment system as for pumping wells.

It should be noted that placement of borings and wells, as discussed in Section 3, will be complicated by the limited extent of the property owned by Longview Fibre. Placement of wells on Longview Fibre property is limited to areas outside the building that cover most of the property and areas not in proximity to utility lines. Access easement will have to be obtained prior to placement of borings or wells off the Longview Fibre property. Remedial actions at the site may also require the preparation of a State Environmental Policy Act (SEPA) checklist because of the proximity of the site to the Duwamish River. Cost estimates for CH2M HILL labor do not include pursuance of access easement or preparation of the SEPA checklist.

The feasibility level cost estimates shown in Section 3 have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, final project scope, final project schedule, the firm selected for final engineering design, and other variable factors. As a result, the final project costs will vary from the estimates presented herein. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.

I removed section 3 because - it had to do with cost estimates.